

SCIENCE.

FRIDAY, JUNE 11, 1886.

COMMENT AND CRITICISM.

IT WILL BE REMEMBERED that in the month of May a gentleman in Brooklyn died from hydrophobia. His medical attendants, competent physicians, had no doubt about their diagnosis, and his symptoms were characteristic of that disease. Confirmatory of this opinion, the autopsy revealed no lesion to which could be attributed the symptoms from which he suffered, — a condition which is also characteristic of hydrophobia. Portions of the brain and the spinal cord were carefully wrapped in cloth wet with a solution of bichloride of mercury and sent to Dr. Sternberg. Small portions of these were thoroughly mixed with sterilized bouillon; and this broth was then, by means of a hypodermic syringe, injected under the dura mater covering the brain of a rabbit, a small button of bone having been first removed by a trephine. The wound was then closed by sutures. Three rabbits were thus operated upon. One died at the end of twenty-four hours as the result of the operation; hydrophobia, of course, having nothing to do with it. Another is now, after eighteen days, apparently well. The third one, on the sixteenth day, commenced to show signs of being ill: he was disinclined to move, and in a few hours evidences of paralysis appeared, at first in the hind-legs, and subsequently in all the extremities. On the 5th of June, the eighteenth day after the operation, he died. The wound had healed, and there were no evidences of inflammation. The brain showed no softening at the point where the inoculation was made, no pus, nor any evidences of inflammation either of the brain substance or of its membranes. The cord also appeared normal. Portions of the medulla of this rabbit were immediately mixed with sterilized bouillon, and two rabbits were inoculated in the same manner as has been described. This case is of great interest as being, so far as we know, the first animal in this country to become affected with hydrophobia from inoculation with material taken from a person who died from that disease. If Dr. Sternberg is as successful with these rabbits as with the first, there is no reason why the series

cannot be continued, and thus the protective virus of Pasteur be obtained in this country, and a trip to Paris by the victims of dog-bites made unnecessary. As we go to press, we learn that the second rabbit, mentioned above as remaining unaffected for eighteen days, shows unmistakable signs of hydrophobia.

IN THE GREAT POLITICAL changes of last December, the Department of public works of Japan was abolished, and the Engineering college hitherto conducted by that department was transferred to the Department of education. Early in the present year, the Engineering college was amalgamated with the University of Tōkyō, and the resulting whole was instituted as the *Imperial university* by the decree of March 1, as mentioned in our last issue. As at present constituted, the university consists of five colleges; viz., those of law, of medicine, of engineering, of literature, and of science. Of these, four are located in the Kaga-yashiki (the former 'yashiki' of the Daimio of Kaga), while the fifth, that of engineering, finds its quarters in the buildings of the former Engineering college. This amalgamation must be looked on as but another stage in the development of that institution which began in the days of the Tokugawa shōguns as the place for teaching, and examining into, western books, and which has been steadily growing, ever since, under various names, such as Kaisei Gakkō, Tōkyō Daigaku (University of Tōkyō), etc. In the imperial decree of March 1, referred to above, the prosecution of original investigation has received recognition hitherto not accorded to it; for Art. 1 of the decree says, "The Imperial university shall have for its objects the teaching of such arts and sciences as are required for the purposes of the state, and the *prosecution of original investigations in such arts and sciences.*" This must be considered as a decided upward step. In the new institution, different colleges have also more power to act independently according to their own wants than before. The very ponderous official machine through which the business of the university had to be transacted is somewhat simplified; and professors, in the science college, for instance, are given more freedom in the management of their own laboratories.

Many Americans who have been in Japan will learn with regret that Mr. H. Katō, who has been in the responsible position of the president of the university for the last nine years, is no longer connected with the university, having lately been transferred to the senate (Genrōin). During his presidency, the university grew up from a very insignificant institution to be one of the great seats of learning in the world. Mr. Katō's services will long be remembered in the university. The president of the new Imperial university is Mr. H. Watanabe. He has occupied with success many positions of responsibility under the government, and was latterly very popular as the mayor of Tōkyō. His appointment to the university is considered by all to be eminently fitting.

MR. GOODRIDGE has another article in a recent *Scientific American* on 'Modifying the climate by closing the Straits of Belle Isle,' in which, as before, his argument is based on the error that the great body of the Labrador current comes to us through these straits instead of around the eastern coast of Newfoundland. He gives no evidence in support of this assertion, but vaguely discusses the question of the origin of ocean-currents, which has nothing to do with his climatic problem. Referring to the objection pointed out in *Science* some months ago, that our cold weather comes from the west and north-west, he grants that this will 'sometimes occur,' as if it were exceptional. He thinks that "if we had not the cold wall between our shores and the Gulf Stream, it is fair to presume that we should have a less stormy coast." This presumption is very questionable indeed; for in winter, when most of our notable storms occur, they do not originate on the coast, but come from the far west and south-west; and, moreover, in the winter season, the contrasts in temperature along our shores would be stronger if the warm Gulf Stream flowed close along the cold land. As far as this contrast is effective, our winters would be more stormy than now.

THE SCIENTIFIC COMMISSION REPORT.

THE long-looked-for report of Mr. Allison's commission on the surveys has at last been completed, and submitted to congress. It proves to be even more conservative than was indicated in the summary of the views of the commission, which was given in our issue of May 7. At that time the members of the commission were all of opin-

ion that the operations of the geological survey should be restricted by law in the direction indicated by Mr. Herbert's bill. The majority, comprising Messrs. Allison and Hale of the senate, and Messrs. Lowry and Wait of the house, now frankly admit that the statements and arguments of Major Powell have led them to modify their views, so that they no longer propose any restriction upon the paleontological or other work of the survey. They therefore propose, in lieu of Mr. Herbert's bill, one which only requires that the printing of the survey shall be specifically estimated for,—a provision to which no one will object, and which ought to be extended to other bureaus of the government. The following sentences from the report embody the gist of its judgment upon the work of the survey:—

The commission is of opinion that the administrative part of the bureau is well conducted and with economy and care, and discloses excellent administrative and business ability on the part of its chief.

The commission expresses no opinion as to the plan of the survey as delineated by the director, as it does not regard itself charged with this duty, nor is it competent to express an opinion on a subject involving so difficult a scientific question. This, in the judgment of the commission, must be left to the criticism of those who are able to do so more intelligently than can the commission, with its limited means of knowledge.

The commission has no doubt of the wisdom of a geological survey of the whole country, and considers the question as to the propriety of its being done by the general government as settled by existing legislation.

In treating of the coast survey, the commission gives an outline of its history from its inception in 1807 until the present time. The report treats at length of the feasibility of transferring the survey to the navy department, and shows that only a small part of its work is of a kind with which naval officers are legitimately concerned. It also speaks with favor of the geodetic work of the survey, sees no occasion for any other legislation than can be incorporated in the appropriation bills, and concludes that the secretary of the treasury can make all necessary regulations governing it.

The report on the signal service will disappoint all who have been dissatisfied with General Hazen's management. It recommends no legisla-

tion changing the general administration of the office, unless the proposed abolition of the 'study-room' and of the school at Fort Meyer be considered such. The commission says that any intelligent young man of good education can learn every thing necessary to the practical work of an observer in six weeks, and sees no occasion for so elaborate a scheme of instruction as that provided. It is not, however, intended to dispense with the services of the able meteorologists who have been employed by the office.

On the question of the military control of the meteorological service, the report is extremely mild. It is found that the work is in no sense military, and that military discipline and law are not necessary to its efficiency. If the question were a new one, whether a civilian bureau with a civil head should be established rather than an extension of a military bureau, the commission would recommend this rather than a military organization. As the matter stands, the commission is equally divided on the question of leaving the service in its present hands. Three do not see why it cannot be as well managed by the chief signal-officer of the army as by a civilian head; three think such a head necessary to its efficiency. All, however, are in favor of cutting down the military staff as it now exists. As with the other bureaus, the commission does not find that Congress can advantageously define the operations of the signal-office by other legislation than such limitations as may be imposed on expenditures in framing the appropriation bills.

The principal minority report is signed by Senator Morgan and Representative Herbert. It consists largely of severe criticisms upon the work of both the coast and geological surveys. The topographical system of the coast survey is strongly condemned on the score of extravagance in delineating minute features of no use whatever to the navigator, and of little or no use to any one else. It favors the transfer of the office to the navy, and would abolish entirely the further prosecution of other geodetic measurements than are necessary to map-making.

Such are the main points of the report. Comment is unnecessary, because there is no reasonable chance of legislation on the subject. The surveys will be left, as they have heretofore been left, in the hands of the appropriation committees. It is expected that the house committee will sympathize with the minority rather than the ma-

jority, so far at least as the coast survey is concerned, and will therefore be disposed to reduce the appropriations to the lowest limit, and perhaps cut down the force also.

HATCHING, REARING, AND TRANSPLANTING LOBSTERS.

THE experiments of Dannevig in hatching the ova of the European lobster, naturally awakened an interest in the propagation of the American species, which, as has been shown by Mr. Rathbun, is becoming less abundant on what were formerly the best lobster-fishing grounds on our coast. This depletion of the supply of lobsters is very probably due in large part to the fact that vast numbers of females are annually caught and killed, together with the many thousands of eggs hanging to their abdominal legs. It happens in this way that not only the individuals most directly concerned in reproducing their species are destroyed, but that almost countless millions of partly developed young are also sacrificed, in the ordinary process of supplying the markets with this crustacean.

Recent experiments under the direction of Capt. H. C. Chester at the U. S. fish-commission station at Wood's Holl, Mass., have demonstrated that it is possible to hatch the ova of the lobster in unlimited quantities in the same device in which the ova of the cod were successfully hatched last year. The eggs, at any stage, may, in fact, be removed from the parent female without injuring her, or an appreciable number of ova making up the masses of eggs hanging to her swimmerets. The eggs, if then placed in the hatching-apparatus, will develop and become embryos, which will free themselves from their investing envelopes in due course of time. The length of the period of incubation is not known, as artificial fertilization of the eggs of this creature is not practicable; though with greater experience, and a wider range of accurate observation, it may soon be possible to state the length of that period pretty accurately. The approach toward the completion of development in the egg is marked by the gradual diminution in the bulk of the yolk, as a result of which the eggs become more and more translucent; so that, by the time they are ready to hatch, they are dirty-yellowish in color instead of dark greenish-brown as at first. At the same time the ova become larger by about one-half their original diameter. Towards the close of the period of development, the eggs also lose their original globular form, and become decidedly oval. During the later stages of development the eggs show

a great range of variation in color, a few being bright crimson-red, while the majority are of a dirty greenish-yellow tint. Similar variations in color are apparent in the young after hatching, and are apparently due, as in the case of the eggs, to the presence of an unusual number of red-pigment cells.

Immediately after hatching, the young swim about in the sea-water, and will at once begin to feed, even killing and eating each other if food is not soon offered them. Minced crab or lobster meat is greatly relished. The recently hatched lobsters are also attracted by the light, and will always collect at the side of the aquarium or tank nearest the source of light. At night, or if the light is shut off, the young lobsters go to the bottom of the tanks; and it seems that they may then be most actively engaged in feeding if food is placed within their reach.

When first hatched, the young lobster measures one-third of an inch long, and is provided with cephalothoracic appendages only. The tail, unlike that of the just hatched crayfish, is without swimmerets. The five thoracic appendages, unlike those of the adult or those of the young crayfish, are biramose, the outer branches or rami being flattened, and fringed with plumose setae. These outer branches of the limbs are rapidly vibrated to and fro, and constitute the principal locomotive appendages of the young lobster during the pelagic stage of its existence, acting like paddles or oars and independently of the inner rami, which are used mainly as prehensile organs. The inner rami of the appendages afterwards become the permanent thoracic limbs, while the outer ones abort.

When from four to six days old, they moult for the first time; and it is noticed that in doing so they suddenly increase in length and bulk, since they now measure nearly half an inch in length. They also, at this time, acquire four pairs of abdominal legs or swimmerets; but the telson is still formed of a broad, single, triangular piece, emarginate posteriorly, and not rounded and serrated behind as in the young crayfish. The pincers of the first pair of thoracic limbs become distinctly developed at the first moult.

It is obvious, from what has preceded, that the lobster passes through a schizopod stage, as pointed out by S. I. Smith. This stage has been omitted in the ontogeny of the crayfish. The young also evidently abandon the mother lobster at once, the blades of their pincers being without hooked tips for clinging to the mother, as in the recently hatched crayfish.

In the course of about eight days more, the young lobsters probably moult again, — a process

which is repeated for the third time in the course of perhaps ten days more, when they will measure about five-eighths of an inch long, and when they have acquired an additional pair of appendages, so that they then have all that are possessed by the adult.

The young lobster probably moults twice more before it is sixty days old, by which time its antennae become fully developed and flagelliform, while its telson loses its larval form, and the animal has thus completed its metamorphosis. It now measures about an inch in length, and is occasionally taken at the surface in a tow-net, though it is probable that it now usually remains at the bottom, concealing itself among the seaweeds and stones, lying in wait for its prey.

Recent experiments conducted by Captain Chester, at Wood's Holl, have demonstrated that it is possible to keep the adult lobsters alive for an indefinite period in a moist, cold atmosphere. These conditions may be most readily satisfied by packing the lobsters between layers of wet seaweed in a metal box with a perforated cover; this metal box being then placed in a larger wooden box, and surrounded with cracked ice, which will cool the contents of the inner box down to 45° F. At this temperature, in this device, lobsters have been kept alive and in good condition for fifteen days, and in a moist atmosphere only; their gills not having been immersed in water during the whole period. Even the eggs hanging to the swimmerets of the females so treated are not injured in the slightest degree, and will continue to develop normally if put into the hatching-jars. The adults also, if taken out of the seaweed in the metal box, and put into sea-water, have the moist air in the gill-chambers at once replaced by the water, and begin to move about as if nothing had happened to them.

This important discovery renders it possible to transport living adult lobsters across the continent, and to stock the waters of the Pacific coast with this important crustacean. It is also possible to pack the eggs in seaweed in a similar manner, and transport them for long distances, after which they may be hatched and reared up to an inch in length by artificial means. This will render it possible to collect lobster-eggs to the number of many millions at several points over the fishing-grounds, and bring them to a great central hatching and rearing establishment, such as that at Wood's Holl, where at least a hundred million eggs may be cared for at one time. The work of propagating the lobster, the cod, and other fishes, will then keep the station at Wood's Holl in practical operation, in an economic direction, for the entire year. The recent successes at

this station, in artificially hatching the mackerel and tautog, indicate that the application of the methods of artificial propagation are capable of still further extension. At present the propagation of the lobster is of the greatest practical importance; and the possibility of feeding and caring for the young in large quantities till they have attained the length of one inch, when they practically abandon their pelagic habits and are able to take care of themselves, seems to be assured.

JOHN A. RYDER.

ROYAL GEOGRAPHICAL SOCIETY.

THE anniversary meeting of this society was held on Monday, May 24, with the president, the Marquis of Lorne, in the chair. The report of the council showed that 173 fellows had been elected during the year, besides three honorary corresponding members. The losses had been, by death 63 (besides one honorary corresponding member), by resignation 75, and by removal 21, making the net increase for the year 16. The total number of fellows on the list, exclusive of honorary members, on May 1, was 3,407.

The president said he considered himself most fortunate in that it was his duty to present to Mr. Phelps, as the representative of America and of his distinguished countryman, Major Greely, the queen's medal for this year. It was the sixth occasion on which a president of that society had greeted the achievements of a citizen of the United States with that honor. In the year 1855 it was accorded to Dr. Kane, who had charge of the expedition generously fitted out by the republic to search for Sir John Franklin. Again, in the year 1867, Sir Roderick Murchison, then president, was able to place in the hands of the American minister the gold medal given to another of his countrymen, namely, Dr. Hayes, who had reached a more northern point of land than any before attained. Dr. Hayes had himself been the companion of Kane, and was the discoverer of that very land, named after Henry Grinnell of New York, which had been the scene of the explorations of Major Greely.

The president then presented the patron's medal to Signor Guido Cora (*Science*, May 28).

The Murchison grant for 1886 was awarded to the brothers F. and A. Jardine, for their remarkable journey overland to the settlement of Somerset at Cape York (Queensland) from May, 1864, to March, 1865, during which they solved the question of the courses of the northern rivers emptying into the Gulf of Carpentaria, and definitely ascertained the area of the York Peninsula adapted for pastoral occupation.

The Back grant for 1886 was then awarded to Sergeant David L. Brainard, in recognition of the effective services rendered by him during the various explorations carried out by the American Arctic expedition of 1881-84.

The president remarked that the active work of the society during the past year had been largely directed towards initiating improvement in geographical education.

The report of the society's inspector, Mr. Keltie, describes the results of Mr. Keltie's visits to universities and schools at home and abroad for the purpose of inquiring into the position of geography in education: it had attracted much attention at home and abroad, and, it was believed, had been productive of good results. The interest excited by the society's recent action had been so great, and the expectation that they should continue it by taking some positive steps towards encouraging improvements in the position of geography in schools and universities was so general, that the council had felt encouraged, and indeed bound, to carry the scheme further. The educational committee of the society therefore made certain suggestions to the council, which were now under consideration, and would probably be adopted. The principal of these suggestions related to the appointment of a lecturer in geography, to deliver courses where the council might direct.

In order still further to encourage the scientific study of geography at the universities, the committee suggested that a prize or travelling scholarship should be given every alternate year to a student who had shown marked ability in geographical subjects, and who might desire to visit one of the less-known districts of Europe, or the Mediterranean or Black Sea shores, and any results to be communicated to the society. One or other of the annual grants which were at the society's disposal might be devoted to this purpose.

Another suggestion was aimed at reaching the intelligent middle and working classes through the medium of the university extension scheme. For this purpose a small annual grant was proposed. Another was that a medal be given by the society to the student reported by the examiners to have done best in physical geography in the first part of the natural sciences tripos (honors examination).

And finally, in order that all classes of schools might be reached, it was proposed that prizes be offered for competence in geography to the students at the various training-colleges. Here they reached the fountain-head of education; and, if they could secure adequate attention to geography in the institutions which sent forth yearly troops

of teachers to the board and elementary schools, the society would have accomplished much. It was perhaps characteristic of the absence of theory in the proceedings of the practically minded average Briton, that they who had done more as a nation to explore and colonize the distant parts of the world than any six other nations should have at home less instruction given in our schools on the subject of geography than was enjoyed by the youth of most of the European peoples.

The belief was expressed that the work of discovery had recently been aided by the Indian army in Burmah, and by the impulse given by Australia to the exploration of New Guinea.

The death of the British commissioner might have temporarily checked measures that would lead to the investigation of this latter country; but they might trust to the enterprise of Ford and other explorers, and to the activity with which Australasian commercial interests were pushed, for additions to our knowledge of an island of which it must with some shame be said that a few birds of paradise had hitherto represented its available export trade. With Baron von Müller as president of the Melbourne branch of the Australasian geographical society, they might be sure that the scientific aspects of the investigation of this magnificent new field would not be overlooked.

In Canada, again, Selwyn and Dawson and Macoun had been engaged in marking the value to science of the recent discoveries in geology, mineralogy, and meteorology made possible by the rapid completion of the Pacific railway across hitherto unknown mountain-ranges, whose ridges were the birthplaces of waters flowing into the Arctic, into Hudson's Bay, and the Gulf of Mexico. So valuable were the storm-signals to be derived from stations in the far north-west, that the American government had gladly placed the observations of nearly ninety stations at the disposal of the Canadian government, in return for those from about twenty in the British dominions.

The messages flashed from Toronto and Washington over the American continent and across the Atlantic had already been the means of saving many thousands of lives, and afforded the most practical recent proof of the immediate utility of scientific induction. The western points at which records were kept were spots wholly unknown to the geographer a century and a half ago.

There are few among our race, whether belonging to the nation of their gold medallist, Greely, or to their own, who would not place a higher value on the discoveries in that north-western

land than on those which should open to them access to the torrid zones. They gladly recognized the gallant efforts made by other races, notably by the Italians; and, while they gave the gold medal to him whom they might almost call their countryman, they were glad to recognize the aid given to their science by Signor Cora, and they condoled with Italy in the recent loss of the leader and members of the expedition recently massacred near Aden.

Having briefly reviewed the chief geographical events of the year, the Marquis of Lorne concluded by saying that the mere string of notes, telling of what in a twelvemonth had been accomplished, showed how quick was now the invading march of knowledge.

A FINAL BUFFALO-HUNT.

THE National museum has sent its chief taxidermist, Mr. William T. Hornaday, on a hunting-tour through the far west, for the purpose of obtaining specimens of the buffalo, before this animal becomes extinct in this country. Mr. Hornaday took with him as an assistant Mr. A. H. Forney, an attaché of the museum. The party reached Miles City, Montana, May 12. Some Crow Indians are said to have killed four buffaloes on the Mussel-shell River about six weeks ago. It is firmly believed by many good authorities that there are not now more than from fifty to one hundred buffaloes in the whole of Montana, outside of the National park, where there are probably from two hundred to three hundred head. Hunters lie in wait outside the limits of the National park, waiting for these animals to cross the line, when they lose no time in despatching them as soon as possible. A stampede may occur at any time, which may result in all the buffaloes now in the park leaving; and if such were the case, very few, if any, would escape.

Mr. Hornaday and his party were received by the commanding officer at Fort Keogh, and furnished with a six-mule team, a driver, and escort. The plan of route is to cross the Yellowstone at Miles City, proceeding up Sunday Creek and Hunter's Creek to its source; thence across to Big Dry River, following it down to the Big Bend; thence across and westward up Big Timber Creek; and eventually across to the Mussel-shell River, which it is proposed to explore almost its entire length. This route probably covers every chance for finding buffaloes in Montana or elsewhere. There is said to be a small herd of from eight to twelve buffaloes in south-western Dakota. This region is a vast, level, treeless prairie utterly

destitute of wood, and it is Mr. Hornaday's opinion that an attempt to find these few would be hopeless. Skins of buffalo-heads are now valued by taxidermists in Dakota at fifty dollars each, from which it may be assumed that they have given up all hope of procuring any more.

Should this endeavor be fruitless, the suggestion has been made that buffaloes may still be obtained in the British possessions.

PARIS LETTER.

THE town of Montdidier (department of Somme), in the north of France, has recently held a series of festivals in honor of Parmentier, who, as is well known, was the first who brought that humble but useful vegetable, the potato, into France. It was in 1786, or thereabout, that Parmentier obtained from Louis XVI. permission to cultivate potatoes in the Plaine des Sablons, near Paris, to show what service could be expected from the new food. The festival of Montdidier consisted of an agricultural exhibition, an exhibition of horses and dogs, and of farming implements, and also of a meeting at which were discussed the names by which the different varieties of potatoes are to be designated hereafter. M. Chevreul was to preside, but could not attend. He wrote a letter, in which he said that Montdidier was for him a second birthplace, "because there was born Mlle. Sophie Davalette, whom I married in 1818, and who made the happiness of my life during nearly half a century." This is certainly a very interesting fact, but has not much to do with Parmentier.

Some days ago there was held in the palace of the Trocadero a festival for the benefit of the Pasteur institute. The very first artists, dramatic and musical, offered their time and talents: and the meeting was a success. The house, which is enormous, was crowded, although prices were high; and after the recital by Coquelin, of some verses of E. Manuel, a very fine ovation was given to Pasteur. He was very pale and much overcome. The whole audience rose, and cheered with all their might. This festival was got up under the direction of *Scientia*, a young scientific society founded by Charles Richet, G. Tissandier, and Max de Nansouty.

Dr. Lagneau has recently presented his report on the principal epidemics of Paris during 1884. (This is an annual report sent to the Conseil d'hygiene.) Some interesting facts are to be noticed in it. It has long been thought and said that typhoid-fever is the most prevalent and most fatal of Parisian epidemics. This, however, is quite untrue: diphtheria is entitled to the first place in the scale. Typhoid-fever, small-pox, and whoop-

ing-cough are becoming more rare than formerly. In 1884 there were 2,592 deaths from diphtheria. Dr. Lagneau's report is a very interesting and useful one, and indicates great progress in the hygienic and sanitary conditions of Paris.

A few days ago I was present at the inauguration of the Exposition d'hygiene urbaine, a very interesting display indeed. I specially noticed a hot-air room for the disinfection of mattresses and clothing (for military and colonial purposes), Redard's method for disinfecting wagons and railway-cars by over-heated steam, etc. The number of implements exhibited is very great, and one might spend many hours in the exhibition without feeling a decrease in interest. It is impossible to enumerate the useful and ingenious apparatus to be seen, and I shall not attempt it.

There has been a very sharp discussion in the Academy of medicine between Pasteur and Béchamp. It is pretty well known that Béchamp has got up a theory on microzymas, which nobody save himself well understands. Microzymas, according to his idea, are molecular granulations which have existed since the beginning of the world,—he does not say which day of creation,—and are possessed of eternal life. But what is the rôle of these microzymas, what is their influence on health and disease, what is their use and their *modus vivendi*, nobody knows. In short, M. Béchamp having attacked Pasteur's experiments with unusual fury, Pasteur arose and said that such discussions were entirely useless, and that the only thing to do was to begin experimenting again, and that M. Béchamp would surely recognize his errors if he only took care to experiment seriously. Pasteur contested every result of Béchamp's experiments, and asked for the appointment of a commission to examine the facts and arguments on both sides: he wants to have done with the microzymas, and to show where the errors lie. We shall certainly have some very interesting discussions soon. The commission has been appointed on Professor Trélat's proposal; and it is believed that M. Béchamp's last idea, viz., that microzymas transform themselves into bacteria, bacilli, and other pathogenetic organisms, will not live much longer.

The statistics concerning rabies in animals during 1885 have just been published. They show that in Paris, or rather in the department of the Seine, the number of rabid animals was 518. Of these animals, 503 were dogs; 13, cats; and 2, horses. Nineteen persons have died of rabies. It should be remarked that the number of cases of rabies in animals was much larger in 1885 than in 1884, — 518 instead of 301, an increase that is not easily accounted for.

I have recently attended three very interesting *séances* given by Professor Luys concerning hypnotism. The meetings were held at his private residence, and were attended only by some personal friends and acquaintances of Dr. Luys. The results of the experiments were very singular indeed, especially during a somnambulist trance. M. Luys has studied, and showed to us, the effects of different drugs and poisons when put in a glass vial, firmly sealed with the lamp, and kept near the patient (*action des médicaments à distance*). Each different drug produces a special and characteristic effect. Valerian does not act like ether or brandy. Wine, brandy, and champagne do not produce exactly the same effects; that is, the drunkenness brought on by the presence of these different alcoholic beverages is not precisely the same, and the differences closely correspond with those observed in persons really intoxicated with wine, brandy, or champagne. For instance, ether acts on Esther N. in the following manner. After a few minutes' application of the ether-vial behind the neck, she grows less drowsy, opens her eyes, and begins laughing and grinning without any reason whatever. Her mirth is soon very great, and even noisy. A very singular fact is that in her normal condition many colors are not seen by her; but under the influence of ether she sees them quite distinctly, and is astonished at the vividness of her color-impressions. Valerian acts upon her very differently. She begins scratching the floor, as cats do, and believes she is disinterring the remains of her mother; and she is in a very sad train of thought. Wine, similarly put behind her back, intoxicates her in a most pronounced and realistic manner: she is certainly in a state of beastly intoxication, and could not possibly be more so if she had really swallowed several bottles of wine. It is quite a sight to witness the experiment. She goes through the whole ordeal from beginning to end, and finally rolls on the floor as drunk as drunkard ever was. Water brings on symptoms of hydrophobia. These experiments fully confirm those of Drs. Burot and Bourru, of Rochefort, on the same subject.

Near the end of last month, during the Easter holidays, the Congrès de sociétés savantes began its meeting in the Sorbonne for the twenty-fourth time. After having been made up entirely of provincial scientists, this society has recently enlarged its membership, and now comprises members from all parts of France. The number of persons who attend this meeting is always very great; but the Parisian members are rather scarce, especially when the weather is as fine as it has been this

year, and tempts them to go and seek in some nook of Compiègne or Fontainebleau forests a week of leisure and rest after a winter of hard work. However, the meeting was very interesting. In the section devoted to economical and social science, presided over by M. Levasseur of the institute, many questions were discussed concerning property, the share that can be given in benefits to workmen, the Torrens act, and similar plans for the *mobilisation* of property, etc. In the historical and archeological section many papers were presented, as usual. These literary scientific studies are the ones that interest the greatest number of members; since these sections are the original society itself, which has only of late added sections for the study of natural history, mathematics, chemistry, and physics.

Apropos of societies, the Association française pour l'avancement des sciences has just published the first part of its report on the Grenoble meeting of 1885. This report is now published in two parts, separately bound as usual: it is published with great care, and is very large.

Professor Duclaux published last week a new edition of his book, 'Ferments et maladies,' under the title of 'Le microbe et la maladie.' It is an entirely new work, and gives a very good account of the facts at present positively known concerning the pathogenetic properties of different bacteria and bacilli. We recommend this book, which is very interesting and well written, although with too many attempts at literary effect.

The Institute of France has been recently called to elect a member in the place of Professor Bouley, deceased some time ago. There was only one candidate of sufficient notoriety and fitness for the place, and this was Professor Chauveau of Lyons, the well-known veterinarian and physiologist. He was elected by a great majority, and is to fill the place of M. Bouley in many ways, being already inspector-general of veterinary schools, and member of the institute, and soon to be elected a professor in the Museum d'histoire naturelle, in M. Bouley's place. His duties will be different from those of his predecessor. He will be professor of general physiology and pathology, instead of professor of comparative pathology, at least it is rumored so; and this is not surprising, Professor Chauveau being by training more of a physiologist than of a pathologist. He is a very able man, has worked a good deal, and thoroughly understands comparative anatomy and physiology. His election in Bouley's place is very favorably commented on here.

M. Laurent has communicated to the Academy of Belgium the results of some experiments on the influence of different bacteria on the growth of

Fagopyrum. He has grown the plant in different sorts of earth, and has found that the bacteria are very useful; since the plants grown in earth filled with bacteria are much bigger and finer than those grown in sterilized *humus*.

The last two numbers of the *Revue scientifique* contain articles on the zoölogical stations of Cette and Concarneau. The laboratory of Cette is well known, and presents the great advantage of a rich fauna to be found in the brackish waters of pools in the salt-marshes, and in fresh water. No place in France offers such a happy combination of different fields for biological students. Professor Sabatier of Montpellier, well known by his numerous and interesting researches on the origin of sexual elements in the vertebrates, founded this laboratory, and he now wishes to develop it. He is trying to raise the money for the purchase of a strip of land, and especially for a new building. It is to be hoped that he will succeed. As to Concarneau, the oldest of all our marine laboratories, it seems to be in good order. It was founded by Costi in 1859. It is a small laboratory, and cannot compete with its younger companions of Roscoff, Banyuls, Cette, Villefranche, and Wincereux; but yet it may render good service. Interesting researches concerning the temperature of the ocean at different depths have been conducted by M. Goiz; and it is intended to study the habits and biology of sardines, a fish very abundant on the coast at certain times of the year, and concerning which very little is yet known.

V.

Paris, May 19.

NOTES AND NEWS.

THE provincial assembly of San Paulo has voted an appropriation of fifty contos of reis (equivalent to about twenty-five thousand dollars) to begin a geographical and geological survey of that province on the plan followed by the surveys of the territories of the United States; and work has already been commenced with the following corps: Prof. Orville A. Derby, director; Dr. Theodoro Sampaio, chief topographer; Dr. Luis Felipe Gonzaga de Campos, and Dr. Francis de Paula Oliveira, geologists. The first work of the commission will be the exploration of the river Parapanema from near its source to its junction with the Parana, which promises to become an important link in the system of internal communications of the empire, and to afford a complete geological section across the various belts of sedimentary formations of the province. The province of San Paulo joins that of Rio de Janeiro on the south, is one of the most interesting and important of the empire, and has as yet received but

little attention from geologists. It is very extensive, is known to possess great natural resources, and embraces the principal coffee-growing sections of Brazil. Operations have probably been begun by this time. With respect to his recent studies in Brazil, Mr. Derby writes, "I have been giving a great deal of attention to petrographical work, with very encouraging results, as I find that the geology of the vicinity of Rio de Janeiro is not so monotonous as I had supposed, as there are within easy reach of the city three ancient volcanic centres, with a great and perplexing variety of eruptive rocks, both in large masses and in small dikes."

—The belief in the occurrence of 'sea-serpents' in the ocean of to-day, though hardly openly averred, is not discountenanced by not a few scientific men whose opinions are entitled to the highest consideration. Dr. J. B. Holder, after giving (in the *Annals of the N. Y. academy of sciences*) an historical account of a 'sea-serpent' observed near Boston, corroborates the adduced testimony by the description of a carcass of a large and unknown animal found off the coast of Florida, as related by highly creditable witnesses. The creature described was over forty feet in length, and nowhere of more than two feet in diameter. Unfortunately the specimen was in an advanced state of decomposition, and no portion was saved. The discovery of the giant squids off the Atlantic coast within recent years demonstrates the possibility of other large animals yet inhabiting the ocean, of whose existence science is yet wholly unaware. May not some descendant of the cretaceous mosasaurs or plesiosaurs yet be among them?

—At a meeting of the Royal colonial institute, held on May 11, in London, a paper on 'Tasmania as it is,' was read by Mr. W. L. Dobson, chief justice of Tasmania. As to the chief industrial pursuits of Tasmania, Mr. Dobson remarked that the largest return was received from sheep's wool, and great attention was devoted to breeding merino sheep, with fleeces of the finest and densest quality. An inexhaustible supply of timber of different kinds was obtained from the dense forests of the island; and hops, oats, and potatoes were among the vegetable produce. There could be little, if any, doubt that the mining wealth of Tasmania was yet in its infancy. As to means of locomotion, 257 miles of railway had been laid down, and 117 nearly completed, and there was a network of telegraphic wires all over the inhabited portions of the colony. No aid was afforded by the state to religion; and of the population, about one-half belonged to the Church of Eng-

land, and one-fourth to the Church of Rome. He believed that Tasmania had not progressed more rapidly because she had hitherto suffered from contiguity to, and comparison with, the neighboring colonies, which offered a wider field and greater scope for the energy and enterprise of the settler. As this field, however, gradually became occupied, Tasmania's progress would again become assured. He thought, however, that a colony which had increased her revenue during the last decade from £340,000 to £550,000, and her exports from £1,000,000 to £1,400,000, was not to be deemed wanting in progress.

—Mrs. J. Lawrence Smith has presented to Harvard college a tablet in memory of her husband. The tablet is of bronze inlaid with silver, and is to be placed with the Smith collection of meteorites purchased by Harvard college after Dr. Smith's death. In the centre of the tablet there is an enamel portrait of Professor Smith, and this is surrounded by the different medals and decorations with which he was honored. It will be remembered that the collection of meteorites was sold for ten thousand dollars, of which sum Mrs. Smith contributed two thousand. With the eight thousand dollars actually received, Mrs. Smith has generously endowed the Smith medal, which is at the disposal of the National academy of sciences.

—The engraving of the various index-catalogue charts for the U. S. coast and geodetic survey has been commenced; the chart of the whole Atlantic coast and Gulf will be out by the middle of August; that for the Pacific coast will be issued Jan. 1. The Pacific coast tide-predictions for the year 1887 are now in the hands of the public printer; the predictions for the Atlantic coast will be sent to the printer this week; and the entire series will be ready for issue by the 1st of August.

—Plate No. 10 of the detailed topographical survey of the District of Columbia, made by Assistant John W. Donn of the U. S. coast survey, under the direction of the engineer commissioners of the district, has been printed and sent to the commissioners. The drawing of plate No. 16 is complete, and will be placed in the hands of the photolithographer this week. This sheet will show the location of the estate recently purchased by President Cleveland for a summer residence. For the want of sufficient funds, it has only been practicable to keep one topographical party at work on this important survey. Those having charge of the direction and execution of this work are urging congress to appropriate sufficient money to employ at least one more party and two skilled draughtsmen, in order to complete it.

—Bulletin No. 15 of the Ohio agricultural ex-

periment-station contains an interesting account of further experiments by Prof. H. A. Weber upon the microscopic methods of distinguishing butter from other fats proposed by Dr. Thomas Taylor, and which were mentioned in a recent number of *Science*. It will be remembered that Dr. Taylor's first claim was that butter, cooled slowly under certain conditions, formed 'globules,' which, when viewed by polarized light, showed a well-defined St. Andrew's cross. Professor Weber having shown that this appearance was not characteristic of genuine butter, but might be produced in any common fat by treatment similar to that applied to the butter, Dr. Taylor then practically abandoned his claims for this test, and called particular attention to another test as being most important and characteristic. According to Dr. Taylor, if a sample of butter is viewed by polarized light, a plain selenite being placed between polarizer and analyzer, a uniform color is observed: if any solid fat, like lard or tallow, be thus viewed, the fat will exhibit prismatic colors. It is this test which has been the subject of Professor Weber's investigations, and he finds it as fallacious as the former one. Any of the fats under consideration, if melted, and cooled slowly, and then submitted to Dr. Taylor's test, will show the prismatic colors, due to the action of the comparatively large crystals formed upon the polarized light. On the other hand, the same fats, if cooled quickly, so as to prevent the formation of large crystals, present the uniform tint claimed by Dr. Taylor as characteristic of butter-fat. An interesting observation was made upon a sample of butter which had been kept in a closed tin box in the laboratory, and had become alternately hard and soft with the changes of temperature, but never melted. This butter, which had hardly been exposed to greater changes of temperature than much country butter is liable to, showed the prismatic colors claimed by Dr. Taylor as characteristic of foreign fats. Professor Weber concludes this account of his experiments in the following words: "Taking the whole of Dr. Taylor's microscopical investigations into account, it may be said that they have received more attention at the hands of American investigators than their crude methods and erroneous conclusions would warrant."

—The distinguished mechanical engineer, Adolphe Hirn, has been decorated with the Order of the rose by the emperor of Brazil.

—Assistant C. H. Boyd of the coast survey has been instructed to make an examination into the changes in the shore line in the vicinity of Monomoy, Mass.; instructions have been issued to Sub-

assistant W. C. Hodgkins to make an examination of the point at Cape Lookout where great changes have been reported since the last examination; Lieutenant-Commander Brownson, U.S.N., chief hydrographic inspector, is now in New York, inspecting the *Gedney*, *Bache*, and *Endeavor*; Lieut. F. S. Carter has been detached from the coast-survey steamer *Gedney*, and placed in charge of the vessels laid up at the New York navy-yard; reports from the steamers *Paterson* and *McArthur*, which are stationed at Wrangle, Alaska, state that the weather is very favorable for work, and the results thus far attained have been most gratifying.

— The Royal academy of sciences at Turin has announced the grand Bressa prize of twenty-four hundred dollars, to be awarded at the close of 1889 for the most meritorious work or discovery in the physical or natural sciences, produced during the years 1886–89. The prize is open to the world.

— The International literary and artistic association, says the *Academy*, will not hold its next congress at Stockholm this year, as had been arranged, but at Geneva, on the 18th of September. The subjects to be discussed will comprise the right of property in *lettres missives*, the agreements as to publication and the relations between authors and publishers, the right of property in the titles of literary and scientific productions, and the assimilation of the right of translation with that of production.

— Naturalists will recall that some fossil egg-masses of insects of extraordinary size were found a few years ago in Colorado in beds referred to the Laramie period, and considered by Scudder as indicating the existence of a neuropterous insect very closely allied to our great 'Hellgramite,' *Corydalus cornutus*. It now appears that precisely similar bodies, at first supposed to be of vegetable origin, have been found in the lignites of Trets, near Aix, France, associated with *Nelumium* in beds universally referred to the lower Garumnian, or, even lower, to the Campanian; that is, to the horizon of the upper cretaceous. The Garumnian has already been compared to our Laramie group.

— The Würtemberg ministry has invited the governments of Bavaria, Austria, Baden, and Switzerland to participate in an examination and surveys of the deeper portions of the Lake of Constance, to serve in the preparation of an accurate map of the lake's bottom. A commission of specialists will meet in Friedrichshaven to decide upon the methods and extent of the proposed undertaking.

— Prof. G. Dewalque of Liège, the secretary of the Commission of the International congress of geologists on the map of Europe, desires to sell his large library *en bloc*, and wishes to know whether some individual or institution will not make him an offer for it on the basis of a catalogue of its contents.

— The output of shad hatched by the U. S. fish commission up to the present time has been 12,000,000. These have been sent away, as fast as hatched, to various streams, and deposited: 356,000 have gone to the Cheat River at Grafton; 370,000 to the Chattahoochee, Georgia; 626,000 to the Chickahominy; 329,000 to the Dan; 758,000 to the Mattaponi; 385,000 to the Pamunky; 1,110,000 to the Occoquan; 757,000 to the Shenandoah; 380,000 to the James; 379,000 to the Appomattox; 603,000 to the Monocacy; 609,000 to the Patuxent; 1,234,000 to the Rivanna; 390,000 to the Accokeek Creek; 389,000 to Aquia Creek; 1,270,000 to the Rapidan; 391,000 to the North Anna; 1,070,000 to the Rappahannock; 1,282,000 to the Little Falls of the Potomac; 1,586,000 to the Hudson; and 1,000,000 to the Colorado. All of these fish are not, of course, counted and numbered. They are measured in the jars. It is known by actual count how many eggs are necessary to fill a jar to the depth of an inch. A quart, it is estimated, will hold 28,000 eggs.

— New discoveries of petroleum in southern California are causing much excitement, says the *Los Angeles Herald*. A well recently bored in Ventura county is yielding fifty barrels of oil daily.

LETTERS TO THE EDITOR.

*** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.

Some devices for teaching historical geography.

A FRIEND having called my attention to some suggestions, in *Science* of April 9, on maps suitable for history classes, it has occurred to me that perhaps the results of several years' experimenting with different devices for teaching historic geography might be of interest to some of your readers.

That helps are needed to illustrate the intricate territorial changes of continental history, scarcely requires to be further emphasized. Much of history, indeed, is little more than the record of such changes. The contrast between the hopeless confusion of many important epochs when studied without historical maps, and the beautiful clearness of the same epochs with the maps, is simply astounding, and is the true warrant for the time honored claim of geography as one of the two eyes of history.

Having become impressed, after a deal of unsatisfactory teaching, that better machinery than the ordinary is almost a necessity, I have spent considerable time and pains trying different devices. For several years I used a map of Europe permanently

painted on the blackboard, and, to show territorial changes, filled in with colored crayons. This method has the great advantage of growing before the class, changing with the history. But it is wanting in cleanness and accuracy, requires much disagreeable labor, and involves destroying the boundaries of the one period before putting on those of the next; so that the eye cannot compare the two stages.

Accompanying this device, I have used that for the pupils which you suggest; i.e., small uncolored outline-maps, to be filled in for successive epochs by the student himself. My class in medieval history last year was required to make eighteen of these. To get the outline-maps, we have copies made by the hektograph process. Tracing-paper can be used to get the first copy, thus bringing this scheme within the reach of every teacher.

We also use your scheme involving a series of wall-maps for successive epochs. With other teachers I have often felt the need of cheap printed outline-maps, to be filled in in the course of the work. In lieu of such outline-maps, we have gotten along pretty well by the use of white holland, which is sufficiently translucent to be used like tracing-cloth; so that the labor of carefully drawing the map has to be performed but once. This material we buy in quantities, so that it costs but twelve cents and a half per yard. To secure the requisite width, two or more pieces can be sewed together. Being strong to resist wear and tear, for maps it is about the most satisfactory material with which I am acquainted.

But the best device, by all odds, which we have yet hit upon, is a system of ground-maps with superposable fractional maps. The original map we mount on a soft pine back, and indicate every change by overlaying it with fractional maps corresponding in natural features to the original, but colored in such manner as to show the altered political relations. Thus, having a map of Italy divided and colored to show its political condition before 1859, — with Sardinia and Piedmont red, Austrian territory yellow, Parma orange, Modena gray, Papal States brown, Tuscany olive, and Naples purple, — we tell the story of Magenta and Solferina; then lay over yellow Lombardy a red Lombardy, to show its acquisition by Sardinia; and a green Savoy and Nice over the red Savoy and Nice, to show how France exacted them as the price of her assistance. Then, on Victor Emanuel's acceptance of the offered sovereignty of Parma, Modena, Bologna, and Tuscany, a red patch is tacked over these districts. So a red Sicily and a red Naples are laid on when Garibaldi's work is done. A red Ancona and Umbria finish the work for 1860. In 1866 Venetia is covered with red; and in 1870, the remainder of papal territory.

During the year we have worked out sets for the territorial history of France from 1550 to 1870, of Prussia from 1400 to 1866, of the Ottoman empire from 1680 to 1866, of western Europe from 395 to 888, etc. From no other plan have we obtained results at all comparable with those of this year.

The advantages of this device are apparent. It is superior to the series of maps, because, 1°, it changes with history; 2°, a more definite concept of the changed territory is obtained when it can be taken off and handled as a piece of cloth; 3°, the student can be set to work out the changes for himself, — to build up or take to pieces the map; and, 4°, it is less expensive, involving but one or two full-sized maps. It is superior to the blackboard

scheme, because, 1°, it is clearer; 2°, it is more accurate; 3°, it is easier to reproduce, and so not too difficult for the student and the overworked teacher; and, 4°, it preserves both the original condition of things and the changed order, each of which can be reproduced in turn, and thus the exact nature and extent of the change can be clearly and definitely seen.

Incidentally, the use of a soft-wood back has suggested several little devices which we find quite helpful. For battles we use a bright red spear-head of stiff cloth fastened with sealing-wax to the head of a needle. These, being removable, are placed on the map just where events call for them; can be made large enough to show across any room without permanently disfiguring the map; do not crowd regions like the Netherlands, where many battles have been fought, till the confusion is hopeless; and, finally, furnish, in putting them on, a useful exercise for the student. Similarly, we use a yellow star on a black circle for treaties of peace, and lines of colored braid to follow expeditions, such as Alexander's or the crusades. Doubtless other expedients of the same nature will suggest themselves.

F. M. TAYLOR.

Albion, Mich., May 28.

Some Ojibwa and Dakota practices.

Science (vol. iii. No. 57) records on p. 298 the discovery of human bones suggesting cannibalism in a cave near the village of Holzon Brunswick, reported to the Berlin anthropological society by Professor Nehring. "It is the first evidence discovered," says the author, "that a race of anthropophagi ever existed in Germany. The bones were not fully calcined, and had evidently been chopped to obtain the marrow. As a still greater proof of cannibalism, it was shown that the bones were thrown in a heap, as if cleared after a meal. . . . In the subsequent discussion Professor Virchow raised some objections to the cannibal theory."

A case like the one in question might sometimes, probably, be referable to exceptional cannibalism; that is, to an act of cannibalism committed under extraordinary conditions, by a race not commonly addicted to the vice, and even in general, perhaps, abhorring it. In solving problems of this sort, it becomes a pertinent inquiry, how savage man of the historic period actually 'takes his meals,' if such they may be called, and whether or not he practises disposing of the residuum of his food in the orderly manner indicated above.

An instance of man-eating, with its attendant circumstances, occurring among the wild Ojibwas of Lake Pokegema, Minnesota, is cited below. It is put on record in this place for the purpose of illustrating exceptional cannibalism in non-cannibal tribes, and of showing how, half a century ago, Algonkins and Dakotas still inhabiting the north-west were accustomed to hew in pieces, distribute, and leave to be gnawed by animals, the slaughtered bodies of their enemies. The given facts, furthermore, emphasize the possible co-existence, in the same aboriginal community, of two widely differing grades of civilization, particularly in the case of savages just emerging from barbarism in virtue of their association with enlightened races.

It should be stated that this paper has been prepared from verbal and written material kindly

furnished the writer by Mrs. Elizabeth Taylor Ayer, a missionary lady who was a keenly interested participant in most of the events reported. Among the early writers of Minnesota, fragments of the same narrative occur, presenting, however, different phases of this history, and altogether lacking the element of continuity.

The Ojibwa band of aborigines settled about Lake Pokegema, in what is now Pine county, Minn., included in 1841 two Ojibwa braves,—one named *We-zhai-ma*; the other called by the missionaries stationed at that point Julius Caesar, both on account of his distinguished bearing, and his prowess in battle.

Some time in May, 1841, these two Indians were despatched down the St. Croix valley to St. Croix Falls for needful supplies. Upon reaching their destination, they learned that their hereditary enemies, the Sioux or Dakotas, were about to attack the Pokegema Ojibwas, when, leaving their supplies behind them, they hastened homeward to give warning of the impending danger.

During the return journey, they encountered the war-party in question, under circumstances which rendered advance and retreat alike dangerous. Without a moment's hesitation, the young Ojibwas fired upon the hostile party, Julius Caesar killing one of the leaders of the expedition: the two then parted from each other, and, in accordance with Indian tactics, fled in opposite directions.

The foe pressed hotly upon Julius. He threw his gun lightly over one shoulder, and, with a backward half-aim, shot dead a second Sioux warrior, who proved to be a brother of the first. These two Sioux braves were sons of Little Crow, senior, a prominent and influential chief of the Kapota band of Dakotas, at that time settled within a few miles of the present site of the city of St. Paul.

Julius himself immediately fell. His body was dismembered. His limbs were literally hewed in pieces and scattered to the four winds. His head was scalped, detached from the trunk, placed in a kettle with fragments of his person, adjusted with the face turned toward the bodies of his victims seated near, and left dangling from the bough of a convenient tree. A friendly party eventually discovered and identified the mutilated remains, and conveyed intelligence of the disaster to the families of the young men at Lake Pokegema. No traces of *We-zhai-ma's* body could be found, but, as he had completely disappeared, it was believed that he likewise had perished at the hand of the enemy.

The Pokegema Indians apprehended further hostilities in the immediate future. The better to guard against surprise, such of them as were dwelling upon the mainland abandoned their places, and took refuge with friends upon a small island near the centre of the lake. The sole approach to this spot being by water, the Pokegemas withdrew their canoes at night from the outer shore, and secured them against capture upon the island. The women had at the proper season planted potatoes, maize, and other vegetables upon the mainland in large open fields which they called gardens. These they cultivated during the day, returning to their island lodges by boat at nightfall.

Three runners were soon despatched from Lake Pokegema to acquaint friends at Mille Lacs with the fate and supposed fate of Julius and *We-zhai-ma*. Early upon the morning chosen for their departure,

they were set across the lake to the west, in canoes, by two young girls of the band, who accompanied them for the purpose of returning the boats used to their owners at the island. A hostile force of Sioux warriors had meanwhile succeeded in penetrating secretly to Pokegema, and these were now ambushed in two bodies upon the eastern and the western edges of the lake. The larger division, of one hundred fighting men, was posted upon the eastern shore, in the rear of the gardens, and was expected to make the main attack upon the Ojibwas. The western party, of thirty, comprising men and some women and boys, was so stationed as to prevent the Ojibwas from retreating across the lake during battle. The latter force had been strictly charged to make no sign until firing should be heard from the eastern shore.

One or two of the Sioux hotheads, however, could not withstand the temptation to fire upon the canoes as they reached the beach. The Ojibwa runners promptly returned the fire, and made for the shore. They finally escaped their opponents by plunging into the forest, though all were more or less wounded.

The two Indian maidens were small creatures of only about twelve years, being pupils at the mission-school. These girls sprang out of the canoes, and in their terror waded from the shore into the shallow waters of the lake. They were pursued and captured by the Sioux party. The men, dragging them to land, butchered them upon the spot, their dying shrieks ringing in the ears of the distracted parents at the island. They were scalped, their heads were cut off, a hatchet was sunk in the brain of each, their bodies were mutilated, and the heads were set up in mockery in the sands of the shore.

In brief, the Sioux party lost two men killed outright, and one mortally wounded. So assured of success in this expedition were they, that they had brought with them a certain number of boys and women to aid in carrying away their anticipated spoils. In finally quitting the field, they possessed themselves of a boat owned by the missionaries, and, depositing their slain within it, moved two or three miles up Snake River, where they landed. Here they arrayed the dead in the best they could procure, and left them seated in an upright position against the trunks of trees.

Two days after the fight, certain of the wild Pokegemas ascended the river in search of the dead bodies of the enemy, which they found arranged as described, and which they proceeded to hew in pieces, and convey to the island for distribution among the members of their band. All those who had lost a relative at the hand of a Sioux were to be supplied with a portion of a Sioux body, those recently bereaved being the first to be served.

The mother of one of the slaughtered girls was a pagan. She received as her allotment the head of a Sioux warrior. The mother and the wife of Julius, who were no longer wild Indians, had appropriated to them an arm each. The savage mother, frantic with grief and rage, repeatedly dashed the head vengefully among the stones, and tossed and spurned it with her foot along the sands until weary, eventually leaving it to be eaten by the dogs, and to moulder away among the refuse of the village. On the other hand, the mother and wife of Julius accepted in silence the customary mementos of victory, and withdrew with them to their lodge. Here the two bereaved women took the dissevered limbs upon their

laps, swathed them carefully in wrappings of cloth selected by the mother from her most valued treasures, repeated above them a short prayer, and, stealing out unobserved, dug a suitable pit and buried them in it.

The night after the return of the Pokegemas with the Sioux bodies, they treated themselves to a great feast at the island, which culminated in the usual hideous orgies. From this banquet the better class of the band absented themselves. Sioux flesh was at this time boiled and eaten with wild rice. Mrs. Ayer, testifying absolutely to this latter point, adds, that the given instance of cannibalism is the only one coming to her personal knowledge during the whole period of her connection with the wild Ojibwas, something more than twenty years.

We-zhai-ma, who had been mourned as a victim of the Sioux, re appeared after the attack on Lake Pokegema. He had managed to elude pursuit while the enemy were busied with their captive, and had finally succeeded in effecting escape. When he eventually resumed his return, it was by a circuitous route which materially delayed his arrival at home.

The events here detailed sealed the fate of the Pokegemas as an independent band. Constant dread of Sioux incursions caused these people to abandon their hunting and fishing grounds at the lake, and betake themselves to regions less accessible to the foe. They melted away from Pokegema as if by magic, withdrawing singly and in groups, and retiring for the most part to the north and north-west; many of them fleeing to Mille Lacs and Lake Superior. Within a very short time they were wholly absorbed in cognate branches of the great Ojibwa tribe, presenting a case of the complete disintegration of an aboriginal community without corresponding loss.

FRANC E. BABBITT.

Coldwater, Mich., June 4.

The agricultural experiment-station of New Jersey.

For a state so peculiarly located with reference to market facilities as New Jersey, and containing, withal, such large areas of unproductive soil, it would seem most appropriate that the study of artificial sources of soil-fertility should constitute, as it does in that state, the primary work of the state agricultural experiment-station.

There are certain features of the work of this New Jersey station, as detailed in its recent reports, to which I wish briefly to direct attention. One of these is, that, with but trifling exceptions, the entire resources of the station are directed to the solution of the chosen problem, and that no attempt is made to skim over the limitless field of agricultural research.

Another notable feature is that the field and feeding experiments, all of which bear directly or indirectly upon the central problem under investigation, are conducted upon the parallel lines of laboratory analysis accompanied by field or stable tests; the fact having apparently been recognized that the chemist's analysis alone is not a sufficient criterion upon which to base an estimate of the agricultural value of a fertilizer or feeding-stuff, although an essential factor in forming that estimate.

A third conspicuous feature of the work of this station is the absence of that class of experiments which can justly be styled 'empirical.' The

field-experiments especially are co-ordinated upon a thoroughly scientific plan, and constitute a form of research which requires for its successful prosecution as high a degree of scientific ability as is ever called for in the chemist's or physiologist's laboratory.

The institution of duplicate experiments on farms in various parts of the state is another commendable feature of this station's work, in that it not only brings under observation the effects of differences in soil and climate, but is educating a number of farmers in the methods of accurate experimentation.

No doubt there are many citizens of New Jersey who feel that their special interests are being neglected by the state experiment station; but I believe that the station is doing wisely in confining its work to such questions of primary importance as may be thoroughly handled. To do a definite work well is far better than to skim over a larger field, especially in science, where half-truths are so liable to be whole errors; and I believe that its present course will the sooner bring to this station the means for enlarging its field of useful work.

C. E. THORNE.

Penetrating-power of arrows.

Some time since, I noticed a letter in *Science* asking for information in regard to the penetrating-force of the arrow.

I have in my possession the sixth dorsal vertebra of a buffalo, the spine of which contains an iron arrow-point. The arrow struck the spine about two inches above the centre of the spinal canal, and penetrated the bone .82 of an inch. The bone at the point struck is .55 of an inch thick, and the point of the arrow protrudes beyond the bone .27 of an inch. The arrow was shot from the right side of the animal, and the plane of the point was horizontal. The animal was mature, and the bones well ossified. Though the vertebra has been much weathered, the epiphyses adhere closely. The animal was not as large as some individuals. The whole vertical length of the vertebra is thirteen inches.

The arrow must have penetrated several inches of flesh before striking the bone. OLIVER MARCY.

North-western university,
Evanston, Ill., May 31.

Spectrum of comet c. 1886.

Comet c. 1886 presents to telescopic vision a rather bright oval of light, with an ill-defined nucleus in the north preceding quadrant. Although a faint object, it was so temptingly situated for observation, that, rather out of curiosity, the telescope, already employed in faint spectroscopic work, was directed upon it. The method of observation, while adapted to use very faint light, is yet supplied with checks against optical illusion. Observations were obtained on May 26, 28, and June 4. They afford five loci of light, agreeing fairly in position with the five series of lines in the low-temperature spectrum of carbo-hydrogen, and afford a strong suspicion of other loci, two of which lie near strong lines in the low-temperature spectrum of oxygen, and others to the low-temperature spectrum of carbo-oxygen. The spectra given in micrometric gaseous spectra by Piazzzi Smyth have in each case been used as reference.

O. T. S.

New Haven, Conn., June 8.

SCIENCE.—SUPPLEMENT.

FRIDAY, JUNE 11, 1886.

ETHICS AND ECONOMICS.

IN the study of no science is it more important to bear in mind the distinction between words and ideas than in political economy. Locke enforces the far-reaching character of this distinction in general in one of the books of his wonderful work, 'Essay on the human understanding.'

The following personal anecdote is narrated; and so weighty is the truth which it conveys, that it ought to be read frequently, and fully grasped: "I was once in a meeting of very learned and ingenious physicians, where by chance there arose a question whether any liquor passed through the filaments of the nerves. I (who had been used to suspect that the greatest part of disputes were more about the signification of words, than a real difference in the conception of things) desired, that, before they went any further on in this dispute, they would first establish amongst them what the word 'liquor' signified. . . . They were pleased to comply with my motion, and, upon examination, found that the signification of that word was not so settled and certain as they had all imagined, but that each of them made it a sign of a different complex idea. This made them perceive that the main of their dispute was about the signification of that term, and that they differed very little in their opinion concerning some fluid and subtle matter passing through the conduits of the nerves, though it was not so easy to agree whether it was to be called 'liquor' or no, — a thing which then each considered he thought it not worth the contending about."

This illustration brings us at once to the heart of a large part of past economic controversies. The same words have stood to different men for different ideas; and in their hot debates about capital, value, money, and the like, they have often been talking about things not at all the same, though they supposed them to be so. One man comes forward with a definition of value, and cries out, 'It is of vital importance,' as if that would settle all the social problems of the ages, whereas he has simply told us how he intends to use a particular word. He has really accomplished nothing in economics. Having settled upon his signs, he is ready to begin work.

I may choose to adopt another definition: what does that signify? Simply this: to me this sign stands for this idea; both may be right, though it is of course important to be consistent, and retain throughout, the same sign for the same idea. Another gives a definition for capital, and then says, "To speak of productive capital is mere tautology."—"Of course, my dear sir," I reply, "the idea of productivity is implied in your definition, but it is not implied in mine. Your proposition, as often happens, is a mere repetition of what you already said about capital in your definition; but capital is not a living definite thing, like a horse or a cow. If it were, our difference of definition might imply error; at any rate, a difference of opinion."

Let us take the case of money. One economist ardently maintains that national bank-notes are money; another denies this. Controversy waxes warm; but ask them both to define money, and you shall find that each included his proposition in his definition. It is mere logomachy, nothing more.

One writer — and a very clever one — says 'value never means utility.' That is absolutely false. Good writers have used it with that meaning. What he ought to have said is, 'according to my definition it can never mean utility.'

When we pass over to definitions of political economy, we encounter like divergence of conception, and this explains much controversial writing. The words 'political economy' do not convey the same meaning to all persons, nor have they been a sign for an idea which has remained constant in time.

A definition means one of two things, — what is, or what one wishes something to be. What is political economy? We can give an answer which will describe the various classes of subjects treated under that designation, or we may simply state what we think the term ought to include. The latter course is that which the *doctrinaire* always follows.

Professor Sidgwick, in his 'Scope and method of economic science,' complains because certain recent writers include 'what ought to be' in their economic discussion. Does political economy include any thing more than what is? Is its province confined to an analysis of existing institutions and the social phenomena of to-day? Here we have to do with a question of fact. What do writers of recognized standing discuss under the

heading or title 'political economy'? Open your *Mill*, your *Schönberg*, your *Wagner*, your economic magazines, and you readily discern that the course of economic thought is largely, perhaps mainly, directed to what ought to be. It is not, as Professor *Sidgwick* says, that German economists, in their declamations against egoism, confound what is, with what ought to be; for no economists know so well what is, but that they propose to help to bring about what ought to be. This is the reason why the more recent economic thinkers may be grouped together as the 'ethical school.' They consciously adopt an ethical ideal, and endeavor to point out the manner in which it may be attained, and even encourage people to strive for it.

This establishes a relation between ethics and economics which has not always existed, because the scope of the science has been, as a matter of fact, enlarged. The question is asked, what is the purpose of our economic life? and this at once introduces ethical considerations into political economy. Of course, it is easily possible to enter into a controversy as to the wisdom of this change of conception. Some will maintain that economic science will do well to abide by the conception current at an earlier period in its development, and restrict itself to a discussion of things as they are. The discussion between representatives of these two conceptions would reveal differences of opinion as regards economic facts and economic forces.

Why should economic science concern itself with what ought to be? The answer must include a reference to the nature of our economic life.

This life, as it is understood by representatives of the new school, is not something stationary: it is a growth. What is, is not what has been, nor is it what will be. Movement is uninterrupted; but it is so vast, and we are so much a part of it, that we cannot easily perceive it. It is in some respects like the movement of the earth, which can only be discerned by difficult processes. We are not conscious of it. Although the thought of evolution of economic life had not until recently, I think, been grasped in its full import, yet economists of the so-called older school, like *Bagehot* and *John Stuart Mill*, admitted that the doctrines which they received applied only to a comparatively few inhabitants of the earth's surface, and even to them only during a comparatively recent period. In other words, English political economy described the economic life of commercial England in the nineteenth century. Now, a growth cannot well be comprehended by an examination of the organism at one period. The physiologist must know some-

thing about the body of the child, of the youth, of the full-grown man, and of the aged man, before he fully understands the nature of the human body. Our biologists, indeed, insist that they must go back to the earliest periods, and trace the development of life-forms forward during all past periods, and they endeavor to point out a line of growth. The modern economist desires to study society in the same manner. *Lord Sherbrooke* and others have claimed for political economy the power of prediction, and this has been based on the assumption that men will continue to act precisely as they have acted in time past. What seems to me a more truly scientific conception is this: the economist hopes to understand industrial society so thoroughly, that he may be able to indicate the general lines of future development. It follows from all this, that the future is something which proceeds from the present, and depends largely upon forces at work in the past.

More than this is true. The economic life of man is to some considerable extent the product of the human will. *John Stuart Mill* draws the line in this way: he says that production depends upon natural laws, while distribution 'is a matter of human institution solely.' Both statements are somewhat exaggerated. The truth is, political economy occupies a position midway between physical or natural science and mental science. It is a combination of both. With the inventions and discoveries of modern times, we seem almost to have solved the problem of production; but the problem of an ideal distribution of products still awaits a satisfactory solution. But how largely does this depend on human will? *Mill* points to the institution of private property as fundamental in the distribution of goods. This is true, and the historical economist discovers that the idea of property is something fluctuating. He ascertains that there was a time when landed property was mostly held in common; that in certain parts of the earth it is still held in that manner; while there are far-reaching variations in systems of land-tenure, even in England, France, and Germany,—all of them, countries in about the same stage of economic development. Take changes in labor. The laborer has been a slave, a serf, and a freeman in various stages of economic development. His condition has been one of human institution, yet how largely fraught with consequences for the distribution of goods. One more illustration: take even railways. How differently would the wealth of the United States to-day be distributed, had we adopted an exclusive system of state railways in the beginning of railway constructions, and adhered to that system!

The ethical school of economists aims, then, to direct in a certain definite manner, so far as may be, this economic, social growth of mankind. Economists who adhere to this school wish to ascertain the laws of progress, and to show men how to make use of them.

It has been said that recent tendencies in political economy indicate a return to Adam Smith; and as in philosophy the watchword, 'Back to Kant,' has come into vogue, it has been thought that political economists ought to find inspiration in the cry, 'Back to Adam Smith!' While recognizing the truth which this implies, I am inclined to the opinion that in some respects the drift is back even to Plato. If you should attempt to develop a conception of political economy out of Plato's writings, would it not, when formulated, be about as follows: Political economy is the science which prescribes rules and regulations for such a production, distribution, and consumption of wealth as to render the citizens good and happy?¹ With this compare Laveleye's definition as found in his text-book: "Political economy may therefore be defined as the science which determines what laws men out to adopt in order that they may, with the least possible exertion, procure the greatest abundance of things useful for the satisfaction of their wants; may distribute them justly, and consume them rationally."² Though exception may be taken to this definition as a rather too narrow conception of political economy, it answers very well the purposes of the present article, for it draws attention to the ethical side of the recent development of economics.

It is well to describe somewhat more in detail the ethical ideal which animates the new political economy. It is the most perfect development of all human faculties in each individual, which can be attained. There are powers in every human being capable of cultivation; and each person, it may be said, accomplishes his end when these powers have attained the largest growth which is possible to them. This means any thing rather than equality. It means the richest diversity for differentiation accompanies development. It is simply the Christian doctrine of talents committed to men, all to be improved, whether the individual gift be one talent, two, five, or ten talents. The categorical imperative of duty enforces upon each rational being perfection 'after his kind.' Now, the economic life is the basis of this growth of all higher faculties, — faculties of love, of knowledge, of aesthetic perception, and the like, as exhibited in religion, art, language, literature, science,

social and political life. What the political economist desires, then, is such a production and such a distribution of economic goods as must in the highest practicable degree subserve the end and purpose of human existence for all members of society.

This is different from the conception of life which is current in society, though it is in harmony with the ethical ideal of Christianity. The majority of the well-to-do tacitly assume that the masses are created to minister unto their pleasure, while this ethical ideal does not allow us to accept the notion that any one lives merely 'to subserve another's gain.' An illustration will make clear this difference. Listen to two ladies discussing the education of the serving-class, and you shall find that the arguments probably all turn upon the effect thereby produced upon them as servants.

As has already been stated, the demand of ethics is not equality. A large quantity of economic goods is required to furnish a satisfactory basis for the life of the naturally gifted. Books, travels, the enjoyment of works of art, a costly education, are a few of these things. Others lower in the scale of development will need few economic goods. One may be able to satisfy all rational needs for what can be purchased for three dollars a day, while another may need four times that amount. Again: while it is probable that those who belong to the ethical school, as it is called, with Mill, look forward with satisfaction to a time when the condition of an ordinary servant will be held to be beneath members of civilized society, it is doubtless true that large numbers to-day, like, perhaps, the majority of our negroes, will find in the condition of servants in really superior families precisely the best possible opportunity for personal development which they are able to use.

The ethical view of economics rejects the communism of Baboeuf as something not merely impracticable, but as something not at all desirable. On the other hand, social ethics will not allow us for one moment to accept the apparent ideal of Renan, when he calmly assures us, that, to such an extent do the many subserve the gain of the few, that forty millions may well be regarded as dung, do they but supply the fertility which will produce one truly great man. Like many others, including indeed representatives of high culture, he seems to regard human development as something existing altogether apart from individuals, as an end to be pursued in itself without regard to the condition of human beings as such.

It cannot well be argued that present society satisfies, in so high a degree as one may rationally desire, the demands of ethics. On the one hand,

¹ See the writer's 'Past and present of political economy,' p. 48.

² Taussig edition, New York, 1884, p. 3.

we see those who are injured by a superfluity of economic goods; and, on the other, those who have not the material basis on which to build the best possible superstructure. In both cases this is waste of human power, or, we might say, waste of man.

It is desired in future so to guide and direct the forces which control the production and distribution of economic goods, that they may in the highest degree subserve the ends of humanity. It is not claimed that the power of man is unlimited, but it is maintained that it can and will accomplish great things.

Here we have at once a standard by which to test economic methods. Take the case of low wages. It is argued that low wages increase possible production. Even if this be so, such wages diminish the power of the recipients to participate in the advantages of existing civilization, and consequently defeat the end and purpose of all production. Child labor, female labor, and excessive hours of labor, fall under the same condemnation. In the language of Roscher, "the starting-point as well as the object-point of our science is man."

It has been said truthfully that the essential characteristic of the new political economy is the relation it endeavors to establish between ethics and economic life. A new conception of social ethics is introduced into economics, and the stand-point is taken that there should be no divergence between the two. While representatives of an older view endeavor carefully to separate the two, the adherents of the ethical school attempt to bring them into the closest relation,—indeed, I may say, an inseparable relation. They apply ethical principles to economic facts and economic institutions, and test their value by that standard. Political economy is thus brought into harmony with the great religious, political, and social movements which characterize this age; for the essence of them all is the belief that there ought to be no contradiction between our actual economic life and the postulates of ethics and a determination that there shall be an abolition of such things as will not stand the tests of this rule. If industrial society as it exists at present does not answer this requirement, then industrial society stands condemned; or, in so far as it fails to meet this requirement, in so far as it is condemned. It is not that it is hoped to reach a perfect ideal at one bound, but that the ideal is a goal for which men must strive. The new conception of the state is thus secondary, in the opinion of the adherents of the ethical school, to the new conception of social ethics. Doubtless there is a new conception of the state; for in this co-operative

institution is discovered one of the means to be used to accomplish the end of human society, the ethical ideal. Perhaps still more important is the departure of economists from the individualistic philosophy which characterized the era of the French revolution, and which has gained such a stronghold in America, because our republic happened to be founded at a time when this view of individual sovereignty was in the ascendant. The philosophy of individualism came to us from England, which had been influenced by France, as well as directly from France, at a time when our thought was in a formative period, and was especially open to new ideas. But the ethical school, I think it safe to say, places society above the individual, because the whole is more than any of its parts. In time of war, society demands even the sacrifice of life: in time of peace, it is held right that individual sacrifices should be demanded for the good of others. The end and purpose of economic life are held to be the greatest good of the greatest number, or of society as a whole. This view is found distinctly expressed in Adam Smith's 'Wealth of nations,' particularly in one place, where he says, "Those exertions of the natural liberty of a few individuals, which may endanger the liberty of the whole society, are, and ought to be, restrained by the laws of all governments." This view, however, does not imply a conflict between the development of the individual and the development of society. Self-development for the sake of others is the aim of social ethics. Self and others, the individual and society, are thus united in one purpose.

It is not possible to develop all these thoughts in a single article, for that would indeed require a large book; nor can any attempt be made to offer any thing like complete proof of the various propositions enunciated. It has been my purpose to describe briefly a line of thought which it seems to me characterizes what is called the new political economy; and it should be distinctly understood that this paper claims only to be descriptive and suggestive.

It may be well, in conclusion, to point out the fact that the ethical conception of political economy harmonizes with recent tendencies in ethics. The older ethical systems may, I think, be called individual. The perfection of the individual, or the worthiness of the individual, to use another expression, was the end proposed. Moral excellence of a single person was considered as something which might exist by itself, and need not bear any relation to one's fellows. Men were treated as units, and not as members of a body. The new tendency of which I speak, however, proceeds from the assumption that society is an

organism, and that the individual is a part of a larger whole. Rudolph von Ihering develops this idea in the second volume of his 'Zweck im Recht.' The source of ethics he finds in society; the end of ethics likewise is discovered in society; and from society, according to this theory, is derived the ethical motive-power which resides in the human will.¹ Social ethics thus replaces individual ethics. Ethics becomes one of the social sciences, and indeed, to use Ihering's expression, the 'queen' of them all. With this view of Ihering, should be compared the teachings of Lotze; and I will close this paper with a quotation of some length from his 'Practical philosophy': "To antiquity, man appeared without any manifest attachment to a coherent system, transcending his earthly life, pre-eminently as a creature of nature, whose aim—not so much moral as altogether natural—could only consist in bringing all the bodily and spiritual capacities with which he is endowed by nature, to the most intensive, and at the same time harmonious, cultivation. . . . This whole culture is not a preparation of the powers for a work to be accomplished; but it is a self-aim to such an extent that the self-enjoyment of one's own fair personality, and its secure tenure against all attacks from without, form the sole content of such a life. . . . Just the opposite of this, under the influence of Christianity, the conviction is formed, that, strictly speaking, every man is called only to the service of others; that the effort to concentrate all possible excellences in one's own person is, at bottom, only a 'shining vice;' but true morality consists in the complete surrender of one's own self, and in self-sacrifice for others. . . . Nothing, therefore, remains for us to do but to supplement the ancient self-satisfaction, without surrendering aesthetic culture, by having all the powers acquired by such culture placed at command for the accomplishment of a life-aim in accordance with motions of benevolence;" and "benevolence, . . . the service of others, constitutes the focal point of ethical ideas."² RICHARD T. ELY.

[A reply by Prof. Simon Newcomb, to this article, will appear in an early number.—ED.]

DR. HUGHLINGS-JACKSON ON EPILEPSY.

FOR many years Dr. Hughlings-Jackson of London has been advocating a theory of epilepsy highly important for its general bearings on

¹ See work, 'Zweck im recht,' A résumé of his arguments may be found in his article, "Die geschichtlich-gesellschaftlichen Grundlagen der Ethik," in *Jahrbuch für Gesetzgebung, Verwaltung, und Volkswirtschaft*, für 1882.

² See Lotze's 'Practical philosophy,' Professor Ladd's edition, Boston, 1855, pp. 58-60.

physiology and psychology, and for its harmonizing with recent results obtained by experiments on animals. An era in the study of cerebral physiology was made when Fritsch and Hitzig discovered that the cortex of the brains of dogs was directly excitable, and that the result of such excitation was a series of co-ordinated movements of definite parts of the body. Dr. Jackson carried this fact over into pathology, and interpreted an epileptic discharge as nothing else than a sudden, rapid, excessive, and discharging cortical lesion: to use his own forcible language, it is simply a brutish development of many of the patient's ordinary movements. "Speaking figuratively, we may say that the epileptic discharge is trying to develop all the functions of the body excessively, and all at once: a severe fit is a fairly successful attempt. Let me give a very simple illustration. If there be a centre for locomotion, then, during slight sequent discharges of its elements in health, there is walking or running; but if very many of those elements were to discharge suddenly, rapidly, and excessively, the man walking or running would not go faster: on the contrary, he would be stopped, would be stiffened up into a tetanus-like attitude by the *contemporaneous* development of many locomotive movements."

In a recent article (*Brain*, April, 1886), Dr. Jackson has further extended and in part modified his theory. His former position was that all discharging lesions issued from the cortex; i.e., the highest developed centres. He now admits that some such discharges have their central seat in less highly organized brain parts. That such is the case in animals was shown by such facts as that convulsions are possible in a rabbit through rapid bleeding, when the brain proper has been removed. This fact Dr. Jackson now carries over to human pathology in a very ingenious way. The fits involved by a discharging lesion of a lower centre, i.e., a medullary centre, would be apt to be connected with the respiratory apparatus which is represented in that region. Now, these 'inward fits,' or respiratory convulsions (laryngismus stridulus), occur mostly in children under one year of age, not often after two. This fact Dr. Jackson interprets as follows: at that period the highest cortical centres are not developed; of the activities developed in the infant at that time, these automatic vital functions are represented in what are then its highest functioning centres; and it is a discharging lesion from these that we see in a respiratory convulsion. The cause of the rapid and excessive discharge is shown to be a rapid increase in the venosity of the blood, which, when mild and gradual, serves as the normal stimulant of that

respiratory centre. Furthermore, the spreading of the convulsions to the trunk and limbs finds its explanation in the fact that almost all the muscles of the body are at the call of the respiratory mechanism, when such additional strain is necessary in order to succeed in the fight for breath. And the whole series of facts finds a striking corroboration in the experiments of Saltmann, who found that the cortex of young puppies was unexcitable before a certain period, owing to the fact that these higher paths of motor effects had not yet been laid down. Dr. Jackson's view of epilepsy has met with considerable favor; and the modification of it now presented adds to this very suggestive, original, and ingenious interpretation of the facts of cerebral physiology and pathology. J. J.

ASTRONOMY IN APPLETON'S 'ANNUAL CYCLOPAEDIA.'

APPLETON'S 'Annual cyclopaedia' has for several years past included a summary of astronomical progress. These summaries have been so far from satisfactory as to call for some critical attention. They have been lacking in nearly every quality which they should have, — literary form, appropriateness, judicious selection, well-digested conclusions, and freedom from doubtful speculations. That for 1885, which has just been issued, does not show the slightest improvement, unless it is that the scissors are less freely used than formerly. In the qualities of redundancy and deficiency it seems, if possible, worse than its predecessors. As examples of the former, we have a whole column devoted to Dr. Huggins's supposed photographs of the solar corona, mixed up with his opinions of its nature and cause. A column is devoted to the red sunsets, which are not shown to have been more numerous than they always have been since the memory of man. Nearly the same space is devoted to pointless remarks upon eclipses in general and the two eclipses of the year. Not a word is said about the observations of these eclipses, — a deficiency which is perhaps compensated by the information that the next central eclipse visible in New Zealand will occur in 1927. The table of periodic comets has nothing to do with the astronomy of the year, and omits the only element of the slightest popular interest; namely, the times of perihelion passage. For the paragraph on occultations it is hard to imagine a *raison d'être*, unless it was to fill space. No allusion is made to any observations of an occultation during the year. More than a page is devoted to the system of telegraphing astronomical discoveries, which has been in operation for several years,

and had, we think, been mentioned in previous volumes of the 'Cyclopaedia.' Any thing more valueless than the paragraph on bibliography it would be difficult to conceive. It concludes by informing us that "the *Sidereal messenger*, the only astronomical journal published on this continent, is issued monthly by Prof. W. W. Payne of Northfield, Minn." This journal so well deserves popular support, that we have no hesitation in repeating the announcement. The unsoundness and inconsistency of the remark on the solar spots are curious. We are first told that there has been no abatement, up to 1885, in their number or magnitude, and that suspicion therefore attaches to the theory of their periodicity. This is followed by several statements fixing the maximum in 1884 or 1885. As a matter of fact, Dr. Wolf fixed the maximum at the end of 1883.

Among subjects omitted may be mentioned, of American origin, Langley's 'Researches on lunar heat;' Hill's 'Contributions to the lunar theory;' Hall's 'Investigation of the satellites of Uranus and Neptune;' the discussion of the astronomical day, which has filled so prominent a place in scientific literature; and the work of Rowland and Pickering in celestial photography. The important foreign works which have been passed over, and which might have well taken the place of the stuffing that forms a third of the article, are too numerous to mention. The only conclusion which can be drawn is, that one-half of the article is better fitted to fill space than to give valuable information about the astronomical progress of the year.

BIMETALLISM IN THE UNITED STATES.

PROFESSOR LAUGHLIN has produced a most valuable book both for study and for reference. It is not only a history, but a critical examination of successive policies in the light of economic theory. It might, perhaps, be objected that the lesson is sometimes a little too obtrusive; but the independent reader who feels under no obligation to accept the author's conclusions may well pardon this fault. The author is a decided monometallist, and presents the arguments from the point of view of his own school. No objection can, however, be made to his statement of facts, and the reader can readily separate his arguments from them. One of the characteristic features of the book is the number, variety, and fulness of its graphic representations, which add greatly to the value of the work, and would have added yet more had they been better planned and arranged.

The history of bimetallism in the United States. By J. LAURENCE LAUGHLIN. New York, Appleton, 1886. 8°.

As an example of possible improvement, we may take the charts showing the fluctuations in the relative values of silver and gold. There are four such charts scattered in various parts of the book, without any apparent connecting-link.

The work is altogether so suggestive, that those who agree, as well as those who disagree, with the author's views, will find ample food for thought in reading it. The ground covered is so wide and the treatment so uniform, that it is scarcely possible to select one passage for comment rather than a score of others. It may be remarked, however, that the author's views of the ethical question involved in the monetary change of 1834 coincide more nearly with those of the advocates of free silver coinage at the present time, than we like to see. Up to 1834 our currency was on an almost pure silver basis, as the value of the gold in the gold dollar was a little greater than that of the silver in a silver dollar. In order to bring gold into circulation, it was necessary to change the ratio, which might be done either by increasing the weight of the silver dollar or diminishing that of the gold dollar. The latter course was adopted, on the ground, that, as silver was the standard at the time, the new coinage of gold should be accommodated to it. Professor Laughlin objects to this, that in reality the change in the marked ratio before 1834, which necessitated the new ratio, consisted in a depreciation of the value of silver; and that in consequence it was the silver dollar which should have been made heavier in order to bring it up to the old standard. This is the very argument on which the silver men now sustain their views. They claim that gold has appreciated in value, and that we should go back to the old silver dollar, the value of which they believe to have been more stable than that of the gold dollar. In either case, we think the sound view to be that the standard for the time being should be accepted rather than that of some past time.

GEOLOGY OF ARABIA AND PALESTINE.

IN 1883 the committee of the Palestine exploration fund wisely took advantage of an interruption of its regular work caused by the interference of the Turkish government to send Professor Hull, with a well-selected party, to explore some of the less-known districts of Arabia Petraea and southern Palestine,—regions of interest not merely geologically, but historically as well.

The route of the party extended through the Sinaitic peninsula, and thence into the Wady

Arabah and to the southern end of the Dead Sea, then over the Judean hills to Gaza, and from this place to Joppa, Jerusalem, and the Jordan valley. The intention to explore farther north was frustrated by the snow of an unusually severe winter. The exploration was thus somewhat limited in its range; but Professor Hull has supplemented it by references to the works of the numerous geologists who have at various times studied the rocks of the districts traversed, and of the adjacent regions around the eastern end of the Mediterranean, which have many points in common.

Geologically considered, the district in question is part of an extensive region of western Asia and northern Africa, characterized by the wide distribution of cretaceous and eocene marine limestones resting on old and for the most part crystalline rocks, and in part overlaid and margined by very recent deposits.

The old gneisses and schists penetrated by great dikes and masses of intrusive granite and diorite, which constitute the mass of the Sinaitic Mountains, and extend thence along the Gulf of Akabah and the Wady Arabah, are similar in mineral characters to the Laurentian rocks of this continent; and Hull agrees with Oscar Fraas and the writer of this notice in referring them and similar rocks of upper Egypt to that ancient system. Thus we have the interesting fact that the nucleus of the old historic lands of Egypt and Arabia is composed of the same venerable rocks which occupy a similar place in northern Europe and in North America. Flanking these oldest rocks, there seem to be in Arabia, as in Egypt, newer slates and schists and igneous rocks, probably of Huronian or old Cambrian date.

Here, however, there occurs a great gap in the sequence, and we find nothing to represent the Siluro-Cambrian, Silurian, or Devonian systems; the next rocks in ascending order being sandstones, conglomerates, and limestones, the 'desert sandstone' of our author, which hold carboniferous fossils. These beds are not of great thickness or horizontal extent, but afford unequivocal evidence of their age in the fossils of the genera *Zaphrentes*, *Productus*, *Orthis*, etc., which they have afforded. A true lepidodendron has also been obtained from the sandstone.

Until recently these carboniferous rocks were confounded with an overlying sandstone of somewhat similar character, but of much greater thickness,—the Nubian sandstone, which is probably of lower cretaceous age, though it is by no means certain that it may not represent the Jurassic or even the trias. The relations of these sandstones, both in Arabia and Egypt, are somewhat perplex-

Physical geology and geography of Arabia Petraea, Palestine, and adjoining districts. By EDWARD HULL. Adelphi, Com. Palestine explor. fund, 1886. 4°.

ing, as they cannot be distinguished by mineral characters; and both are usually at low angles of inclination, while fossils are rare. It would seem probable that the conditions of deposit which prevailed in the carboniferous recurred at the commencement of the cretaceous, after a long continental interval.

The most important formation in Palestine is the great cretaceous limestone, overlying the Nubian sandstone, and constituting the mass of the hills of Judea, Samaria, and Galilee, while it extends northward into the Lebanon, and spreads itself on the south in the plateau of the Tih. This great calcareous formation corresponds in age to the chalk of Europe, and must be at least two thousand feet in thickness. Some difficulty has occurred in separating it from the Jurassic beds which underlie it in Hermon and Anti-Libanus, and from the eocene limestones which rest upon it in some parts of Palestine, and more extensively in Egypt. Our author does not deal very definitely with these questions, and indeed the sphere of his explorations was too limited to render this possible, except in the way of collating authorities.

The later tertiary deposits are not conspicuous in Palestine. Our author regards the calcareous sandstones of Philistia as being probably upper eocene; but the evidence which he adduces is not at all conclusive, and there seems quite as much reason to believe them to be a continuation of the miocene beds of the Isthmus of Suez, or probably of the still later isthmian series of that district. The evidence of fossils is wanting; and I am not aware of any miocene fossils in Syria, except perhaps in the conglomerates resting on the cretaceous in the vicinity of Tahleh in the Lebanon. On the whole, there can be little doubt that, as Hull believes, the miocene tertiary was in this region a time of shallowing water and of prevailing land conditions. This is well illustrated by the sandstones of Jebel Ahmar, near Cairo, and their petrified forests.

A number of interesting questions connect themselves with the great submergence of northern Africa and western Asia in the early pleistocene age, when Asia and Africa were separated by a wide channel, the valley of the Nile was an arm of the sea, the coast districts of Palestine were submerged, and a great lake or inlet occupied the Jordan valley. Hull illustrates this with a map showing the probable geography of this period. It is equally certain that this submergence was succeeded in the later pleistocene or post-glacial period by an elevation of the land, when an inland lake receiving the waters of the Nile seems to have existed on the present isthmus. It is this second continental period which is con-

nected with the first appearance of remains of man, — a subject in regard to which nothing new seems to have been observed. Other points of interest, and which Hull discusses at some length, are the great Jordan valley fault, throwing down the basin of the Dead Sea to a depth of 1,290 feet below the Mediterranean. The remarkable geographical features resulting from this great dislocation, the old marginal deposits of the Dead Sea, the hot springs on its borders, the salinity of its water, its climatic conditions, and its historical associations would open a field so large, that another article would be required for their discussion, more especially as there are points on which some difference of opinion may well exist.

THE collections made in the Bahama Islands by the naturalists of the fish-commission steamer *Albatross* contain several new species of birds and reptiles. There are two new woodpeckers of the genus *Centurus*, from the islands of Abaco and Watlings, or San Salvador, and two new warblers of the genus *Geothlypis* from Abaco and New Providence, while there are possibly some new races to be described also. Kirtland's warbler (*Dendroeca Kirtlandi*) was found on Watlings, Abaco, and Green Cay. Probably not more than half a dozen specimens of this species have hitherto been known. Another rarity was the Bahama cuckoo (*Saurathera bahamensis*), of which four specimens were obtained on New Providence Island. An apparently new species of blind worm (a peculiar family of snakes resembling worms, and covered with fish-like scales) is interesting as coming from a more northerly latitude than animals of this kind have yet been found in, having never before been taken in the Bahamas. The iguana was found in limited numbers on San Salvador. It is not known to exist on any other islands of this group except Andross. There are several valuable snakes in the collection, one being a very rare boa five or six feet long, from New Providence. There are many new species of lizards from Abaco and elsewhere. These shore collections were gathered at such times as the vessel anchored at suitable places, and are quite distinct from the dredging of fishes and marine invertebrates, the usual work of the vessel. There is the usual variety of undescribed and interesting material of the latter class, which appears to be inexhaustible. The winter cruises of the *Albatross* are undertaken with the co-operation of the fish commission and the hydrographic office, on account of the extensive series of deep-sea soundings that are taken for the latter department, and have proved of great value to this service.